REMARKS

Claims 1 - 8 and 12 - 23 are pending in the above-identified application. Claim 12 is withdrawn from consideration.

In the Office Action of November 20, 2002 Claims 1 - 8 and 13 - 23 were rejected. No claim was allowed. In response, Claims 1 - 4 and 13 - 22 are amended. Reexamination and reconsideration are respectfully requested in view of the foregoing amendments and the following remarks.

Rejection of Claim 4 under 35 U.S.C. §112, first paragraph

Claim 4 is rejected under 35 U.S.C. §112, first paragraph, on the alleged grounds that the amendment to change "fluorine nitric acid" to "hydrofluoric or nitric acid is new matter. The Examiner alleges that the recitation of "hydrofluoric or nitric acid" is not in the original Japanese priority document.

In response, and to more accurately reflect the meaning of the corresponding portion of the priority document, Claim 4 is amended to recite "fluoric and nitric acid".

Accordingly, it is respectfully submitted that the rejection under 35 U.S.C. §112, first paragraph, is thereby overcome.

Rejection of Claims 19 and 21 under 35 U.S.C. §102(e) over O'Donnell

Claims 19 and 21 were rejected under 35 U.S.C. §102(e) as being anticipated by O'Donnell et al (U.S. Patent No. 6,069,035). The Examiner alleges that O'Donnell teaches a method of etching a metal layer, such as the NiFe alloy used in the fabrication of read/write magnetic heads, teaches plasma etching of a metal layer

that is disposed beneath an etching mask and teaches rinsing the substrate to remove residual material.

This rejection is traversed. In particular, Claims 19 and 20 were amended in Applicants' previous response to provide that drying is carried out by placing the rinsed body on a hot plate. O'Donnell does not contain a drying step.

As an explanation of the drying step, when a transition metal such as NiFe is etched by a Cl_2 series gas, corrosion thereof is comparatively severe, and corrosion after etching cannot be prevented by simple rinsing. In the present invention, it was discovered that if the rinsed body is immediately (within 10 seconds) placed on a hot plate at about 200°C to drive away the residual water, complete corrosion prevention can be achieved. This feature is neither disclosed nor suggested by O'Donnell.

Accordingly, it is respectfully submitted that Claims 19 and 21 are not anticipated by O'Donnell.

Rejection of Claims 1 - 7 under 35 U.S.C. §103(a) over O'Donnell in view of Page

Claims 1 - 7 were rejected under 35 U.S.C. §103(a) as obvious over O'Donnell in view of Page et al (U.S. Patent No. 5,269,035). The Examiner alleges that O'Donnell teaches a method of etching a layer comprising a transition metal using a plasma containing chlorine and argon while maintaining the temperature of the substrate support at 40°C, followed by a second step of rinsing the substrate with 90°C deionized water to remove chlorine residue from the substrate and that O'Donnell teaches that the metal layer may be patterned by etching through a

patterned photoresist mask. The Examiner acknowledges that O'Donnell does not teach using a hot plate to dry the substrate after it has been rinsed with water, but alleges that this is taught by Page. The Examiner takes the position that it would have been obvious to dry the substrate using a hot plate because Page teaches that this is the typical method of drying substrates.

This rejection is respectfully traversed. Page discusses the use of a hot plate in connection with a prior art method of baking a substrate to remove chorine residue after plasma etching. The baking step is described as taking place before, not after, the substrate is rinsed with water. See, for example, column 1, lines 54 - 67 and column 2, lines 40 - 42. Further, although Page does discloses in column 4,lines 51 - 53 the use of a hot plate to bake a wafer after spraying, it can be presumed that since the method of Page is directed to a plasma etching of the metal layer including a lower titanium-tungsten adhesive sublayer, a copper/aluminum bulk conductor sublayer and an upper titanium-tungsten adhesive sublayer, the baking temperature would have to be comparatively high. The present invention, on the other hand, is directed to a method etching of a lamination layer including an NiFe alloy layer or NiFeCo alloy layer. In this context, drying does not require high baking temperatures. Accordingly, the independent claims of the present invention are amended to provide that the heating on a hot plate to dry the substrate takes place at a temperature below 230 °C. This limitation is neither taught nor suggested by Page and the combination of O'Donnell and Page therefore does not teach the claimed invention

Accordingly, it is respectfully submitted that the Claims 1 - 7 as amended

would not have been obvious over O'Donnell or Page, alone or in combination.

Rejection of Claim 8 under 35 U.S.C. §103(a) over O'Donnell and Page in view of Takagi

Claim 8 was rejected under 35 U.S.C. §103(a) over O'Donnell and Page in view of Takagi (U.S. Patent No. 5,520,716). O'Donnell is applied for the same reasons given above with respect to Claim 1. The Examiner further alleges that O'Donnell teaches that the method is useful in the fabrication of magnetic heads. The Examiner acknowledges that O'Donnell does not teach that the PERMALLOYTM layer being etched is on a sintered Al_2O_3/TiC substrate. The Examiner alleges that Takagi teaches a sintered Al_2O_3/TiC substrate and takes the position that it would have been obvious to use a sintered Al_2O_3/TiC substrate when applying the method of O'Donnell to the fabrication of a magnetic head.

This rejection is traversed. As discussed above, Claim 1, from which Claim 8 depends, is amended to provide that the specimen created by the method steps is dried by placing it on a hot plate and heating it at a temperature below 230 °C after the rinsing step. This feature is neither disclosed nor suggested by O'Donnell, Page or Takagi.

Accordingly, it is respectfully submitted that Claim 8 would not have been obvious over O'Donnell, Page or Takagi, alone or in combination.

Rejection of Claim 14 under 35 U.S.C. §103(a) over Otsuka in view of O'Donnell and further in view of Page

Claim 14 was rejected under 35 U.S.C. §103(a) over O'Donnell in view of Otsuka (U.S. Patent No. 6,282,776). The Examiner alleges that Otsuka teaches a method of fabricating a magnetic head comprising each of the component layers recited in the claims and that the method includes etching the seed layer and then plasma etching the gap layer with a Cl or F containing gas. The Examiner acknowledges that Otsuka does not teach removing chlorine or fluorine residue with a liquid rinse. The Examiner takes the position that it would have been obvious to remove chlorine fluorine residues with a liquid rinse and that it would have been obvious to dry the substrate using a hot plate because Page teaches that that this is the typical method of drying substrates.

This rejection is traversed. Claim 14 is amended to provide that the rinsed body is dried by placing it on a hot plate after the rinsing step and heating it at a temperature below about 230 °C. As discussed above, this feature is neither disclosed nor suggested by O'Donnell, Page or Otsuka.

Accordingly, it is respectfully submitted that Claim 14 would not have been obvious over O'Donnell, Page or Otsuka, alone or in combination.

Rejection of Claims 13, 15 - 18, 20, 22 and 23 under 35 U.S.C. §103(a) over Otsuka in view of O'Donnell and Page and further in view of Ichihara

Claims 13, 15 - 18, 20, 22 and 23 were rejected under 35 U.S.C. §103(a) over Otsuka in view of O'Donnell and Page and further in view of Ichihara (U.S. Patent

No. 5,607,599). The Examiner's allegations with respect to Otsuka, O'Donnell and Page are the same as those set forth with respect to Claim 14, above. The Examiner acknowledges that Otsuka does not teach etching the seed or shield layers with argon and chlorine, but alleges that etching NiFe allow layers such as seed or shield layers with an argon and chlorine plasma is taught by Ichihara. The Examiner alleges that it would have been obvious to use the plasma etching method of Ichihara.

This rejection is traversed. The independent claims of the application are amended to provide that the specimen created by the method steps is dried by placing it on a hot plate after the rinsing step and heating it at a temperature below 230 °C. As discussed above, this feature is neither disclosed nor suggested by Otsuka, O'Donnell, Page or Ichihara..

Accordingly, it is respectfully submitted that Claims 13, 15 - 18, 20, 22 and 23 would not have been obvious over Otsuka, O'Donnell, Page or Ichihara, alone or in combination.

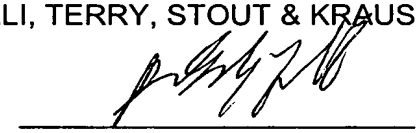
Conclusion

In view of the foregoing amendments and remarks, it is respectfully submitted that Claims 1 - 8 and 13 - 23 are in condition for allowance. Favorable reconsideration is respectfully requested.

Should the Examiner believe that anything further is necessary to place this application in condition for allowance, the Examiner is requested to contact applicants' undersigned attorney at the telephone number listed below.

Kindly charge any additional fees due, or credit overpayment of fees, to Deposit Account No. 01-2135 (503.38156X00).

Respectfully submitted,
ANTONELLI, TERRY, STOUT & KRAUS



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~~IN THE CLAIMS~~

1. (three times amended) A method of processing a specimen comprising:

a first step of etching a specimen, which is a lamination layer formed on a substrate and includes at least one layer made of NiFe alloy or NiFeCo alloy, by gas plasma with a gas which contains chlorine at a temperature of the specimen below 200°C in an etching chamber;

a second step of removing a residual chlorine component deposited on an exposed portion of said lamination layer during said first step, and eliminating debris deposited on a side wall thereof by rinsing the same using at least one liquid; and

a third step of drying the specimen after the rinsing thereof by placing the specimen on a hot plate and by heating the specimen at a temperature below 230 °C.

4. (twice amended) A method of processing a specimen according to claim 1, wherein said second step of liquid rinsing includes one or more than two of the following steps:

(A) pure water rinsing,

(B) alkaline liquid cleaning followed by water rinsing,

(C) acidic liquid cleaning followed by water rinsing,

(D) ~~hydrofluoric acid or~~ fluoric acid and nitric acid cleaning followed by water rinsing,

~~(E) neutral detergent cleaning followed by water rinsing.~~

13. (three times amended) A method of manufacture of a magnetic head having an upper magnetic pole and a lower magnetic pole disposed opposite thereto and including a seed layer processing thereof, comprising the steps of:

forming a lamination layer comprising a seed layer made of NiFe or NiFeCo alloy, an upper magnetic pole made of NiFe alloy contacted to said seed layer, a gap layer made of an oxide such as alumina or silicon oxide in contact with said seed layer, and a shield layer made of NiFe alloy in contact with said gap layer;

plasma-etching said seed layer using a gas which contains chlorine with said upper magnetic pole used as its mask;

removing a residual chlorine component by liquid rinsing; and

drying the rinsed body formed by the above steps by heating at a temperature below 230 °C after placing the same on a hot plate.

14. (twice amended) A method of manufacture of a magnetic head having an upper magnetic pole and a lower magnetic pole disposed opposite thereto and including a gap layer processing thereof, comprising the steps of:

forming a lamination layer comprising a seed layer made of NiFe or NiFeCo alloy, an upper magnetic pole made of NiFe alloy contacted to said seed layer, a gap layer made of an oxide film in contact with said seed layer, and a shield layer made

of NiFe alloy in contact with said gap layer;

etching said seed layer;

~~etching said gap layer by plasma processing using a gas which contains~~ chlorine or fluorine with said upper magnetic pole used as its mask;

removing a residual chlorine and/or fluorine components by liquid rinsing; and

drying the rinsed body formed by the above steps by heating at a temperature below 230 °C after placing the same on a hot plate.

15. (twice amended) A method of manufacture of a magnetic head having an upper magnetic pole and a lower magnetic pole disposed opposite thereto and including a trim-processing thereof, comprising the steps of:

forming a lamination layer comprising a seed layer made of NiFe or NiFeCo alloy, an upper magnetic pole made of NiFe alloy contacted to said seed layer, a gap layer made of an oxide film in contact with said seed layer, and a shield layer made of NiFe alloy in contact with said gap layer;

etching said seed layer;

etching said gap layer;

trim-etching said shield layer using a gas which contains chlorine by plasma processing with said upper magnetic pole used as its mask;

removing a residual chlorine component by liquid rinsing; and

drying the rinsed body formed by the above steps by heating at a temperature below 230 °C after placing the same on a hot plate.

16. (twice amended) A method of manufacture of a magnetic head having an upper magnetic pole and a lower magnetic pole disposed opposite thereto, comprising the steps of:

forming a lamination layer comprising a seed layer made of NiFe or NiFeCo alloy, an upper magnetic pole made of NiFe alloy contacted to said seed layer, a gap layer made of an oxide film in contact with said seed layer, and a shield layer made of NiFe alloy in contact with said gap layer;

plasma-etching said seed layer, said gap layer and said shield layer consecutively with said upper magnetic pole used as a mask; and

applying a corrosion prevention treatment for removal of a residual chlorine component deposited on an etched surface thereof, including rinsing of the body to be treated and drying the same by heating at a temperature below 230 °C after placing the same on a hot plate.

18. (twice amended) A method of manufacture of a magnetic head having an upper magnetic pole and a lower magnetic pole disposed opposite to each other, comprising the steps of:

forming a lamination layer comprising a seed layer made of NiFe or NiFeCo alloy, an upper magnetic pole made of NiFe alloy contacted to said seed layer, a gap layer made of an oxide film in contact with said seed layer, and a shield layer made of NiFe alloy in contact with said gap layer;

plasma-etching said seed layer and said gap layer consecutively with said upper magnetic pole used as a mask; and subsequently,

applying a corrosion prevention treatment for removal of a residual chlorine component deposited on an etched surface thereof, including rinsing of the body to ~~be treated and drying the same by heating~~ at a temperature below 230 °C after placing the same on a hot plate.

19. (twice amended) A method of manufacture of a magnetic head having an upper magnetic pole and a lower magnetic pole disposed opposite to each other for manufacturing said upper magnetic pole thereof, comprising the steps of:

forming a lamination layer comprising an upper magnetic pole layer made of NiFe alloy, and a mask layer of a photo resist or an oxide film made of alumina or silicon oxide film which is laminated on said upper magnetic pole;

plasma etching said upper magnetic pole using said mask layer as its mask; and then

applying a corrosion prevention treatment for removal of a residual chlorine component deposited on an etched surface thereof, including rinsing of the body to be treated and drying the same by heating at a temperature below 230 °C after placing the same on a hot plate.

20. (twice amended) A method of manufacture of a magnetic head having an upper magnetic pole and a lower magnetic pole disposed opposite to each other and including a process for manufacture of said upper magnetic pole thereof, comprising the steps of:

forming a lamination layer comprising, sequentially from above,

(A) a photo resist film,

(B) an oxide film layer made of alumina or silicon oxide,

(C) an upper magnetic pole layer made of NiFe alloy,

(D) a seed layer made of NiFeCo alloy for bonding said NiFe alloy,

(E) a gap layer made of an oxide film of alumina or silicon oxide, and

(F) a shield layer made of NiFe alloy;

carrying out the following plasma etching steps in continuous succession,

(Step 1) etching said oxide film layer using said mask layer as its mask,

(Step 2) etching said upper magnetic pole layer using said 5 oxide film layer as it mask,

(Step 3) etching said seed layer using said upper oxide film layer or said upper magnetic pole layer as its mask,

(Step 4) etching said gap layer using said upper oxide film layer and said upper magnetic pole layer as its mask, and

(Step 5) trim-etching said shield layer using said upper oxide film layer and said upper magnetic pole layer; and after that,

applying a corrosion prevention treatment for removing a residual chlorine component deposited on an etched surface thereof, including rinsing of the body to be treated and drying the same by heating at a temperature below 230 °C after placing the same on a hot plate.